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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PS 2742 for a patent by COCHLEAR LIMITED as filed on 03 June 2002.



WITNESS my hand this
Sixteenth day of June 2003

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AUSTRALIA

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Cochlear Limited

PROVISIONAL SPECIFICATION

Invention Title:

*Clothing attachment device for a speech processor of a
cochlear implant*

The invention is described in the following statement:

Technical Field

The present invention relates to a device for attaching a body-worn device to an item of clothing. In particular, the invention is a device for
5 mounting a speech processor unit of a cochlear implant to the clothing in a manner that results in the unit not being readily removable from the clothing unless one is in the possession of an unlocking device.

Background Art

10

Cochlear implants have been developed to assist people who are profoundly deaf or severely hearing impaired, by enabling them to experience hearing sensation representative of the natural hearing sensation. In most such cases, these individuals have an absence of or destruction of the hair
15 cells in the cochlea which naturally transduce acoustic signals into nerve impulses which are interpreted by the brain as sound. The cochlear implant therefore bypasses the hair cells to directly deliver electrical stimulation to the auditory nerves with this electrical stimulation being representative of the sound.

20

Cochlear implants have traditionally consisted of two main parts, an external speech processor unit and an implanted receiver/stimulator unit. The external speech processor unit has typically been carried in a pouch or removably clipped on the clothing worn by the user. Its main purpose has been
25 to detect the sounds using a microphone and then convert the detected sound into a coded signal through an appropriate speech processing strategy.

This coded signal is then sent to the receiver/stimulator unit, which is typically implanted in the mastoid bone of the user, via a transcutaneous link.
30 The receiver/stimulator unit processes this coded signal and outputs a series of stimulation sequences. These sequences are transmitted to appropriate electrodes of an electrode array by respective electrically conducting wires. The array is positioned proximal to the modiolus of the cochlea such that an electrical stimulus output by the electrodes is then applied to the auditory
35 nerve.

For infants born with sensorineural hearing loss, studies indicate that it is desirable to implant a cochlear implant as soon as possible after birth. This is because if that infant is to develop an ability to understand and process sounds such as speech, the brain must learn to receive and process signals representative of sounds in the first few years of life.

A problem with infants and even small children is that small children are not aware of the importance of their external speech processor unit and often do not notice when the unit has become detached from their clothing. Children are also naturally inquisitive and as they get older will often detach the speech processor unit from their clothing to examine the unit or pass it among their friends. This often results in the unit being mislaid. When a group of children having cochlear implants play together it is also not unknown for these children to detach their external speech processor units and swap them with those of their friends. As the units are programmed to meet the hearing needs of that particular child, this often results in the unit being reported as faulty by the parents or guardian of the child when in fact the child no longer has their original unit.

With regard to adults, it is common for many adult cochlear implant recipients to prefer to use a body-worn external processor for particular conditions, such as in a work or home environment, as opposed to a behind-the-ear processor which is more preferable when mobility and aesthetics is an issue. One of the main problems with body-worn processors is that they are often attached to the body by way of a removable fastener, for example, a belt clip. Whilst such an attachment means allows the device to be easily removed when needed, it can also be uncomfortable to wear and can often be inadvertently dislodged through normal body movement, which can cause unnecessary irritation to such recipients.

The present invention is directed to providing a solution to the abovementioned problems.

Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is solely for the purpose of providing a context for the present invention. It is not to be taken as an

admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this application.

5 Disclosure of Invention

Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not
10 the exclusion of any other element, integer or step, or group of elements, integers or steps.

The present invention is directed to a mechanism for attaching a component to the clothing of a user of that component. In particular, the
15 mechanism is operable by an unlocking device that is typically held in the possession of a person other than the person wearing the clothing to which the component is mounted.

In one aspect, the present invention is a clothing attachment device for
20 an external component of a hearing prosthesis, the attachment device comprising:

an elongate member adapted to pass through at least a portion of an item of clothing; and

a receiving means adapted to receive at least a portion of the elongate
25 member and lockingly engage therewith;

wherein at least one of said elongate member and said receiving means are mountable to the external component and the engagement of said elongate member and said receiving means is releasable by an unlocking means.

30 In another aspect, the present invention is an external component of a hearing prosthesis, the external component comprising:

a casing;

an elongate member adapted to pass through at least a portion of an item of clothing; and

35 a receiving means mounted to the casing and adapted to receive at least a portion of the elongate member and lockingly engage therewith;

wherein the engagement of said first member and said receiving means is releasable by an unlocking means.

In a still further aspect, the present invention is an external component of
5 a hearing prosthesis, the external component comprising:

a casing;

an elongate member extending outwardly from the casing and adapted to pass through at least a portion of an item of clothing; and

a receiving means adapted to receive at least a portion of the elongate
10 member and lockingly engage therewith;

wherein the engagement of said elongate member and said receiving means is releasable by an unlocking means.

In these aspects, the hearing prosthesis preferably comprises a cochlear
15 implant. In this case, the external component preferably comprises a speech processor unit for receiving signals from a microphone and converting the detected sound into a coded signal through an appropriate speech processing strategy.

20 In one embodiment, the elongate member can comprise a pin member extending from a proximal end to a distal end. Where the elongate member extends outwardly from the casing of the external component, the pin can be integrally connected to the casing, permanently mounted thereto, or releasably mountable thereto.

25

In another embodiment, the elongate member can comprise a head and a pin member extending from the head to a distal end.

Where the elongate member has a head, the head can be formed
30 integrally with the pin member or formed separately and then attached thereto. The pin member is preferably formed of a metal, such as stainless steel. The head is can be formed of a metal and/or a plastics material.

In one embodiment, the head comprises a disc, such as a circular disc,
35 having a diameter greater than that of the pin member. The head member preferably has a diameter at least 10 and preferably greater than 20 times the

diameter of the pin member. The disc is preferably relatively flat with its underside adapted, in use, to be positioned against the clothing.

5 The distal end of the pin member can have a tapered or pointed end to assist in the passage of the pin member through an item of clothing. It is also envisaged that the distal end of the pin member could also be blunt or rounded in certain situations, for example to avoid sharp implements being used with regard to young children's clothing.

10 In a preferred embodiment, the receiving means is adapted to be mounted to the casing of the speech processor unit of the hearing prosthesis. In one embodiment, the receiving means can be non-removably mounted to the casing. In another embodiment, the receiving means can be removably mounted to the casing.

15 The receiving means preferably comprises an orifice extending into the receiving means from a front surface thereof. The orifice is preferably able to receive at least a portion of the length of the elongate member. The orifice preferably extends from the front surface to a chamber within the receiving means.

20 The chamber of the receiving means preferably has a inner wall of which at least a portion thereof is frusto-conical such that the chamber expands in diameter away from the front surface of the receiving means. In a preferred embodiment, the inner wall is frusto-conical over its entire length from a forward end to a rearward end of the chamber.

25 The receiving means can further comprise a pin engagement means adapted to frictionally engage the pin member on insertion of the pin member through the orifice and into the chamber. In one embodiment, the engagement means can comprise a plurality of metallic spheres disposed in a circular arrangement within the chamber. The spheres are preferably normally positioned in an engaging configuration within the chamber. This configuration is preferably provided by a biasing means positioned within the chamber and which when in its relaxed condition displaces the spheres towards the forward end of the chamber. The frusto-conical wall of the chamber serves to

compress the spheres towards each other as the spheres are biased towards the front surface of the receiving means. On insertion of the pin member into the receiving means, the pin member can be forced between the respective inner surfaces of the spheres. The spheres in the engaging configuration do
5 though provide sufficient frictional engagement with the pin member to prevent its withdrawal therefrom by at least a child, and even preferably an adult.

In one embodiment, the biasing means can comprise a spring, such as a spiral spring. The spring is preferably adapted to urge a plate against the
10 spheres within the chamber and so hold the spheres in the engaging configuration. In one embodiment, the spring is mounted between the rearward end of the chamber and the plate, the plate being mounted to the forward end of the spring.

15 As defined, an unlocking means is used to disengage the elongate member from the receiving means. In one embodiment, and where the receiving means utilises the spheres to provide frictional engagement with the pin member, the unlocking means can comprise a magnet that can be brought adjacent the rearward edge of the receiving means. The magnet preferably
20 has a magnetic field of a strength sufficient to overcome the bias provided on the spheres by the spring and so cause the spheres to move rearwardly relative to the chamber. As the spheres move relatively rearwardly, the increase in diameter of the chamber serves to allow the spheres to move apart so at least reducing the frictional engagement between the spheres and the pin
25 member and allowing the pin member to be withdrawn from the receiving means.

Where the hearing prosthesis is being worn by a child, the magnet may be kept in the possession of a supervising adult, such as a parent or guardian.
30 When the external component is to be removed from the clothing, the magnet can be retrieved, and used to disengage the pin member from the receiving means. When the prosthesis is to be used again, the option is open to pass the elongate member through an item of clothing and then into the orifice and chamber of the receiving means. It is preferred that the bias provided by the
35 spring is of a strength that allows a typical adult to force the pin into the receiving means with the result that it is engaged by the spheres without the

necessity to firstly use the magnet to withdraw the spheres prior to insertion. It will be appreciated that in another embodiment, this could be a requirement for successfully engaging the pin member to the receiving means.

5 Brief Description of Drawings

By way of example only, a preferred embodiment of the invention is now described with reference to the accompanying drawings, in which:

10 Fig. 1 is a simplified pictorial representation of a prior art cochlear implant system;

Fig. 2 is a simplified view of one embodiment of a clothing attachment device according to the present invention;

15

Fig. 3 is a view of the clothing attachment of Fig. 2 depicting the external speech processor unit of a cochlear implant prosthesis attached to clothing; and

20 Fig. 4 is a view of the clothing attachment of Fig. 2 following disengagement of the processor unit from the clothing.

Best Mode for Carrying Out the Invention

25 While it is to be understood that the present invention has wider application, the invention will be hereinafter described with reference to its application to mounting a speech processor of a cochlear implant to the clothing of a user of the implant.

30 Before describing the features of the present invention, it is appropriate to briefly describe the construction of one type of known cochlear implant system with reference to Fig. 1.

Known cochlear implants typically consist of two main components, an
35 external component including a speech processor unit 29, and an internal component including an implanted receiver and stimulator unit 22. The

external component includes a microphone 27. The speech processor unit 29 is, in this illustration, constructed and arranged to be clipped to the clothing of an implantee or carried in a pouch worn by the implantee. In the depicted arrangement, a transmitter coil 24 receives signals from the speech processor
5 29 through cable 5 which in turn transmits signals to the implanted unit 22 via a radio frequency (RF) link.

The implanted component includes a receiver coil 23 for receiving power and data from the transmitter coil 24. A cable 21 extends from the implanted
10 receiver and stimulator unit 22 to the cochlea 6 and terminates in an electrode carrier 20. The signals thus received are applied by the electrodes of the carrier 20 to the basilar membrane 8 thereby stimulating the auditory nerve 9. The operation of such a device is described, for example, in US Patent No. 4532930.

15 Turning to Fig. 2, a portion of the processor unit 29 having a clothing attachment device according to the present invention is depicted, the clothing attachment device being incorporated into the body of the speech processor. The device comprises an engagement device that is adapted to receive and
20 frictionally engage with the elongate portion 32 of a pin 33. The elongate portion 32 of the depicted pin 33 is formed from stainless steel, with a portion of the elongate portion tapering adjacent to the distal end 35 to assist in passage of the pin 33 through an item of clothing 40.

25 As depicted, the pin 33 can have a relatively flat disc-shaped head 34 with the elongate portion 32 extending therefrom to a distal end 35. In the depicted embodiment, the head 34 is formed of stainless steel material, however the head 34 could also be formed of a polymeric material or other suitable material, and still remain within the scope of the present invention..
30 The depicted head 34 has a diameter at least 10 times that of the diameter of the elongate portion 32. It will be appreciated that in another embodiment, the elongate portion 32 could extend from the processor unit 29 with the engagement device mountable to the pin 33.

35 The pin engagement device has an orifice 36 extending into the device from a front surface 37 thereof that is able to receive at least a portion of the

length of the elongate portion 32 of pin 33. As depicted, the orifice 36 extends from the front surface 37 to a chamber 38.

The chamber 38 has a frusto-conical inner wall 39 such that the chamber
5 38 expands in diameter away from the front surface 37. Disposed within the chamber 38 is a plurality of metallic spheres 41, or ball bearings. These spheres 41 are disposed in a circular arrangement within the chamber 38. The spheres 41 are normally positioned in an engaging configuration within the chamber 38 as is depicted in Fig. 2. This configuration is provided by a spring
10 42 positioned within the chamber 38 which when in its relaxed condition displaces the spheres 41 towards the forward end of the chamber 38, namely that end of the chamber 38 closer the pin 33. The frusto-conical wall 39 of the chamber 38 serves to compress the spheres 41 towards each other as the spheres 41 are pushed by the spring 42 towards the front surface 37. In the
15 depicted embodiment shown, the front surface 37 is that surface of the attachment device/speech processor which abuts with the clothing.

On insertion of the pin 33 into the orifice 36, the pin 33 can be forced between the respective inner surfaces of the spheres 41. As depicted in Fig. 3,
20 the insertion of the pin 33 can result in the spheres 41 being moved relatively rearwardly a small distance within the chamber 38. The spheres 41 in the engaging configuration do though provide sufficient frictional engagement with the pin 33 to prevent its withdrawal therefrom by a child, and even preferably an adult.

25

As depicted, the spring 42 urges a plate 43 against the spheres 41 within the chamber 38 and so holds the spheres 41 in the engaging configuration.

Once the pin 33 is inserted into the engagement device, it serves to
30 maintain the unit 29 clipped to the clothing 40 as is depicted in Fig. 3.

To unclip the pin 33 from the engagement device, a magnet 44 can be brought adjacent the rearward end of the device as is depicted in Fig. 4. The magnet 44 has a magnetic field of a strength sufficient to overcome the bias
35 provided on the spheres 41 by the spring 42 and so cause the spheres 41 and the plate 43 to move rearwardly relative to the chamber. As the spheres 41

move relatively rearwardly, the increase in diameter of the chamber 38 serves to allow the spheres to also move apart sufficiently to reduce the frictional engagement between the spheres 41 and the pin 33 and so allow the pin 33 to be withdrawn from the engagement device.

5

Where the cochlear implant is being worn by a child, the magnet 44 can be kept in the possession of a supervising adult, such as a parent or guardian. When the processor unit 29 is to be removed from the clothing 40, the magnet 44 can be retrieved, and used to disengage the pin 33 from the engagement
10 device. When the prosthesis is to be used again, the option is open to pass the pin 33 through an item of clothing 40 and then into the orifice 36 and chamber 38. It is preferred that the bias provided by the spring 42 is of a strength that allows a typical adult to force the pin into the device with the result that it is engaged by the spheres 41 without the necessity to firstly use the magnet 44 to
15 withdraw the spheres 41 prior to insertion. It will be appreciated that in another embodiment, this could be a requirement for successfully engaging the pin 33 to the device.

The present invention provides a mechanism for ensuring a speech
20 processor unit 29 of a cochlear implant remains in place and clipped to the clothing of a child wearer, particularly an infant. This has particular advantage in ensuring the processor 29 is not inadvertently lost and also has the potential to reduce the likelihood of damage to the unit during normal play and activities of a child or infant.

25

It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be
30 considered in all respects as illustrative and not restrictive.

Dated this third day of June 2002

Cochlear Limited
Patent Attorneys for the Applicant:

F B RICE & CO

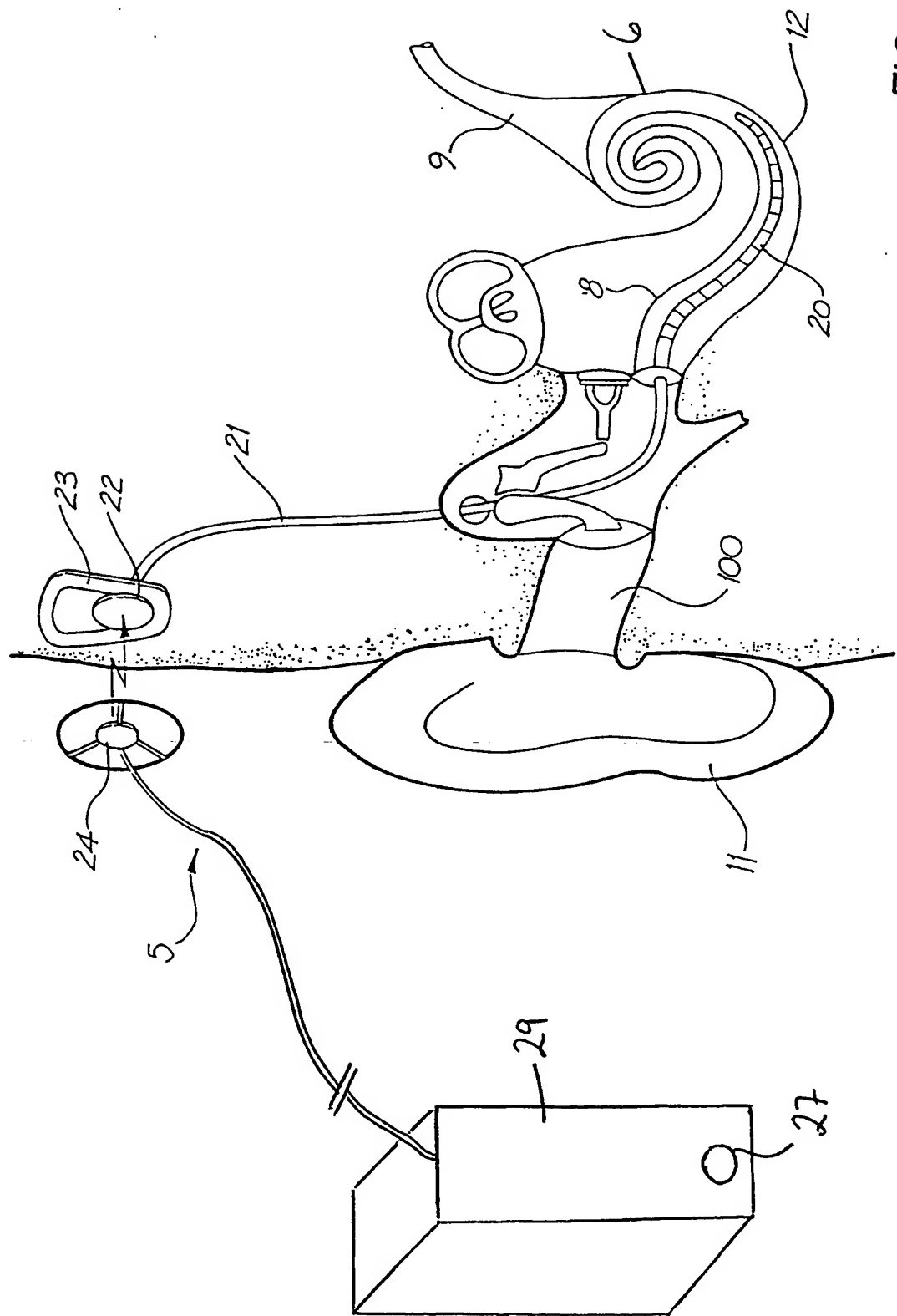


FIG. 1

FIG. 2

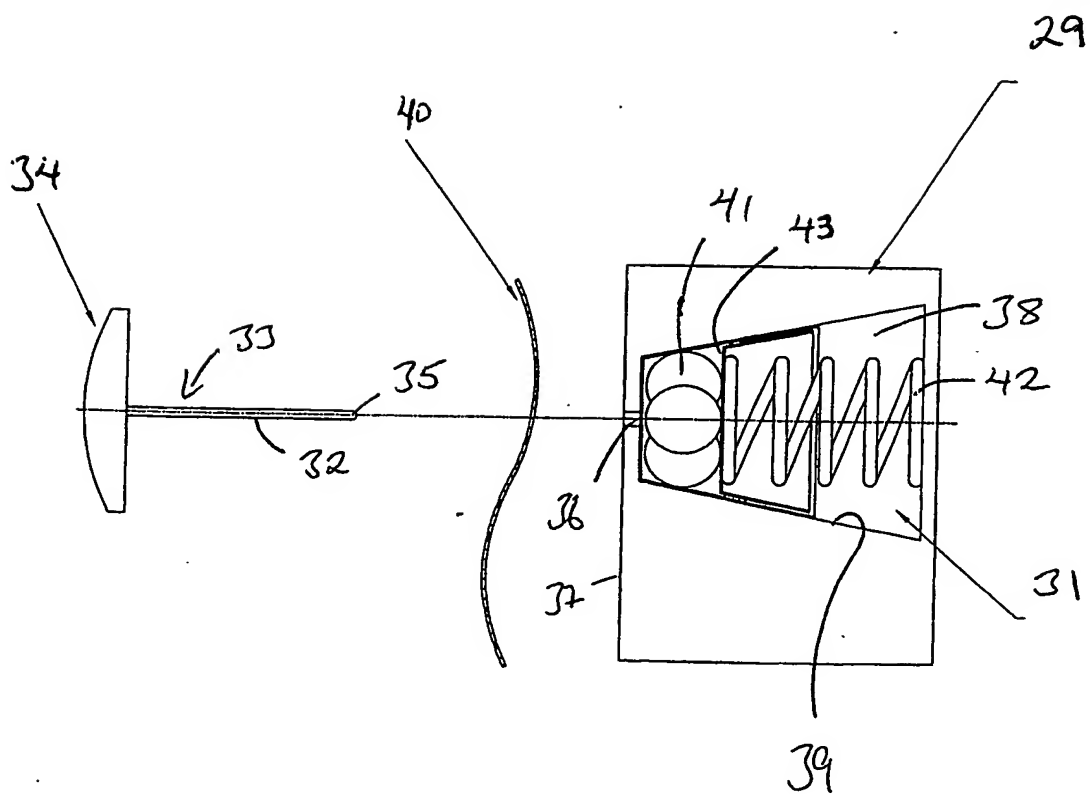


FIG. 3

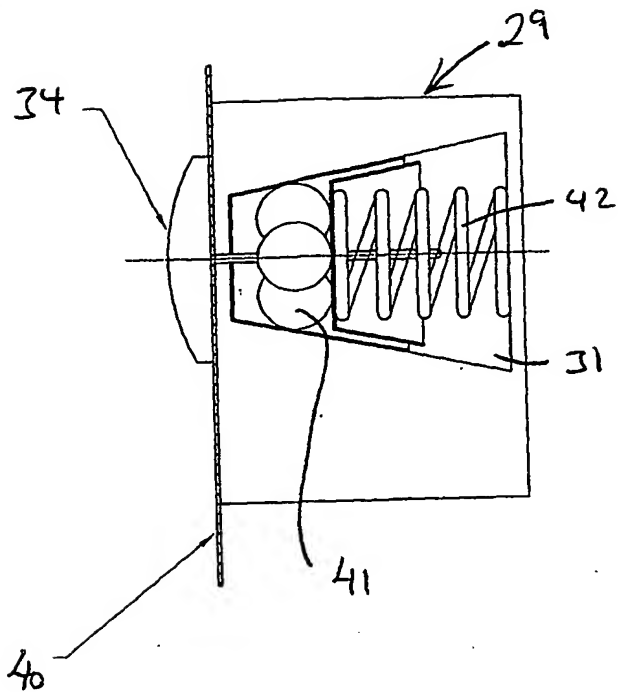


FIG. 4

